

REMARKS

Claims 1-12 are pending in this application. By this Amendment, claim 1 is amended. Claims 13-21 are canceled, as drawn to a non-elected invention, without prejudice, to or disclaimer of, the subject matter recited in those claims. Reconsideration based on the above amendments and the following remarks is respectfully requested.

Entry of the amendments is proper under 37 CFR §1.116 since the amendments: (a) place the application in condition for allowance for the reasons discussed below; (b) do not raise any new issue requiring further search and/or consideration since the amendments amplify issues previously discussed throughout prosecution; (c) are responsive to clarifying inputs made by the Examiners during a personal interview; and (d) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented because the Office Actions presented in this matter, Rejection and Final Rejection, were not clear regarding the Examiner's interpretation of the claim language. Entry of the amendments is thus respectfully requested.

Applicants appreciate the courtesies shown to Applicants' representative by Examiners Nguyen and Tugbang in the July 20, 2004 personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks. Specifically, claim 1 is amended to comply with the Examiners' helpful suggestions made during the interview. Applicants continue to believe that the added feature was already implicitly present in claim 1, but have added this feature, as suggested by the Examiners, for clarification and to expedite prosecution.

The Office Action, in paragraph 9, indicates that claims 7-10 contain allowable subject matter. Applicants appreciate this indication of allowability but submit that independent claim 5, from which claims 7-10 indirectly depend, is allowable for the reasons discussed below.

The Office Action, in paragraph 3, rejects claim 1 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,878,484 to Araya et al. (hereinafter "Araya"). This rejection is respectfully traversed.

Araya shows, in Fig. 4, a chip mounting apparatus including a chip suction nozzle 38 with a nozzle cap 68, and a chip observing camera 42 for taking an image of a chip 90 held by the suction nozzle 38. See also Fig. 11. Applicants respectfully submit that, in Araya, the chip observing camera 42 takes an image of the chip 90 at a high position above, and distant from, the component-mounting surface 62 of the printed circuit board. Therefore, when the suction nozzle 38 holding the chip 90 is lowered from the high position to the component-mounting surface 62, the position of the center (or rotation axis) of the suction nozzle 38 relative to the chip observing camera 42 may have deviated from the previously known positional relationship between the center of the nozzle cap 68 and the chip observing camera 42.

Claim 1 recites, among other features, detecting, on a position-detecting plane including the component-mounting surface of the circuit substrate, the position of the rotation axis of the suction nozzle, wherein the position-detecting plane is co-planar with the component mounting surface of the circuit substrate. Applicants respectfully submit, and it was agreed by the Examiners, that Araya fails to teach or suggest actually detecting a position of a rotation axis of the suction nozzle on a position-detecting plane including the component-mounting surface of the circuit substrate wherein position detecting plane is co-planar with the component mounting surface of the circuit substrate.

The Office Action, in paragraph 10, references Araya at col. 9, lines 34-47 as allegedly teaching to use the reference mark on the surface of the circuit board for accurately mounting the chip to a mounted position on the circuit board. Applicants respectfully submit that the referenced passages actually recite that a positioning mark may be provided so as to

have a predetermined positional relationship to a chip mounted position on the printed circuit board 62. A positional relationship between the chip mounting head 36 and the board mark observing camera 44 is predetermined; therefore, it is possible to accurately know the chip mounted position on the printed circuit board through an image processing unit for processing a video signal on the board mark observing camera 44 based on an image of the positioning mark on the printed circuit board 62. Applicants respectfully submit that Araya only teaches using a predetermined relationship between the chip suction nozzle and the board mark observing camera, and that thus there is no detection (nor would there be any reason to perform detection) of the actual position of the suction nozzle. As such, Araya fails to teach, or even suggest, detecting on a position-detecting plane including the component-mounting surface of the circuit substrate, the position of the rotation axis of the suction nozzle, wherein the position-detecting plane is co-planar with the component mounting surface of the circuit substrate, as is recited, among other features, in independent claim 1.

Applicants' representative discussed the claim language with Examiners Nguyen and Tugbang in the July 20 personal interview. The Examiners asserted that the language of "on a position-detecting plane including the component-mounting surface of the circuit substrate" does not mean that the "position-detecting plane" and the "surface of the circuit substrate" have to be on the same plane or coplanar. Applicants amend the language of claim 1 in order to clarify the relationship between the position-detecting plane and the component-mounting surface of the circuit substrate. The amendment of claim 1 introduces no new matter in that it is supported at least by paragraphs [0005] - [0010] of the specification as originally filed.

Accordingly, reconsideration and withdrawal of the rejection to claim 1 under 35 U.S.C. §102(b) as being anticipated by Araya are respectfully requested.

The Office Action, in paragraph 6, rejects claim 1-6 and 11 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,438,425 B1 to Kawada. This rejection is respectfully traversed.

Kawada teaches a method for measuring an accuracy with which an electronic component mounting system mounts one or more electric components on a circuit substrate (Abstract). Kawada teaches a method of detecting a first relative position between a component camera 68 and a rotation axis of a suction nozzle 62, and a relative position between a fiducial-mark camera 66 and the rotation axis of the suction nozzle 62. The first relative position is detected by rotating the suction nozzle 62 holding a standard chip 100, to different angular positions and taking, with the component camera 68, perspective images of the chip 100 held by the suction nozzle 62 at those regular angular positions, as shown in Fig. 4. As is apparent from Figs. 1 and 4, the first relative position is detected at a high position above, and distant from, a component mounting surface 16 of a printed wiring board. Note the positions of the cameras 66 and 68 above the prism 72 in Fig. 1 of Kawada.

The second relative position between the fiducial-mark camera 66 and the rotation axis of the suction nozzle 62 is detected by placing the standard chip 100 on a chip-place position 102, shown in Fig. 1, and taking with the fiducial-mark camera 66, an image of the standard chip 100 placed on the chip-place position 102 (col. 24, lines 21-41). When the suction nozzle 62 holding the chip 100 is lowered from the high position where the first relative position between the component camera 68 and the rotation axis of the suction nozzle 62 was detected, to a lower position where the chip-place position 102 is provided, the position of the rotation axis of the suction nozzle 62 relative to the component camera 68 may have deviated from the actually detected first relative position, in like manner to the apparatus disclosed in Araya. Kawada's method assumes that the first relative position detected at the high position distant from the component mounting surface 16 of the printed wiring board

does not change when the suction nozzle 62 holding the chip 100 is lowered from the high position to the component-mounting surface 16, and thus, there is no reason to detect the position at the surface 16.

In contrast, because Applicants have recognized that the first relative position may change, Applicants' method, according to claim 1, involves actually detecting, on the position-detecting plane including the component-mounting surface, the position of the rotation axis of the suction nozzle, or according to claim 5, preparing a calibration member having, substantially on the position-detecting plane, a support surface and at least one first positioning reference, and placing, on the support surface, a calibration gauge having at least one second positioning reference.

In particular, regarding claim 5, Kawada teaches placing, with the suction nozzle 62, the standard chip 100 on the chip-place position 102 and taking, with the fiducial-mark camera 66, a first image of the standard chip 100 placed on the chip-place position 102. Kawada does not teach or suggest moving, with the suction nozzle, the standard chip 100 away from the chip-place position 102, rotating the suction nozzle 62 holding the chip 100 by a predetermining angle, replacing the chip 100 on the chip-placed position 102, taking a second image of the chip 100 placed on the chip-placed position 102, or processing the thus-obtained two images to determine a relative position between the chip 100 and a rotation axis of the suction nozzle 62.

Further, again with reference to paragraph 10 of the Office Action, Kawada does not teach placing the standard chip 100 on the circuit substrate 16. Kawada teaches only measuring, with the electric-component mounting system, at least one positional error of one of the component holder, the first image-taking device and the second image-taking device relative to one or each of the others of the component holder, the first image-taking device and the second image-taking device. As such, Kawada fails to teach or suggest detecting a

position of a rotation axis of the suction nozzle on a position-detecting plane including a component-mounting surface of the circuit substrate wherein the position-detecting plane is co-planar with the component-mounting surface of the circuit substrate.

Applicants respectfully submit that, based on the above, Kawada neither anticipates nor suggests the subject matter of independent claims 1 and 5. Further, dependent claims 2-4, 6 and 11 contain all of the features of independent claims 1 and 5 from which they respectively depend. As such, Kawada neither anticipates nor suggests the subject matter of dependent claims 2-4, 6 and 11.

Accordingly, reconsideration and withdrawal of the rejections to claims 1-6 and 11 under 35 U.S.C. §102(e) as being anticipated by Kawada are respectfully requested.

The Office Action, in paragraph 12, rejects claim 12 under 35 U.S.C. §103(a) as being unpatentable over Kawada. This rejection is respectfully traversed.

Dependent claim 12 contains all of the features of independent claim 5 from which it depends, and because Kawada does not teach or suggest all of the features of claim 5, as discussed above, Kawada neither anticipates nor suggests the subject matter of dependent claim 12.

Additionally, this application and the patent to Kawada were, at the time the invention of this application was made, owned by, or subject to an obligation of assignment to, a common assignee. As such, Kawada is unavailable as a reference under 35 U.S.C. §103.

Accordingly, reconsideration and withdrawal of the rejection to claim 12 under 35 U.S.C. §103(a) as being unpatentable over Kawada are respectfully requested.

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-6, 11 and 12, in addition to the allowable subject matter of claims 7-10, are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,



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